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## Cocoa Flavanol Supplementation and Exercise: A Systematic Review

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### Abstract

**Background:** Cocoa flavanols (CFs) have antioxidant and anti-inflammatory capacities and can improve vascular function. It has recently been suggested that CF intake may improve exercise performance and recovery. This systematic review aimed to evaluate the literature on the effects of CF intake on exercise performance and recovery and exercise-induced changes in vascular function, cognitive function, oxidative stress, inflammation, and metabolic parameters.

**Methods:** Two electronic databases (Pubmed and Web of Science) were searched for studies examining the combination of CF intake and exercise in humans (up to 28 March 2017). Articles were included if the exact amount of CFs was mentioned. The methodological quality and level of bias of the 13 included studies was assessed according to the checklist for randomized controlled trials from the Dutch Cochrane center.

**Results:** Acute, sub-chronic (2 weeks) and chronic (3 months) CF intake reduced exercise-induced oxidative stress. Evidence on the effect of CF on exercise-induced inflammation and platelet activation was scarce. Acute CF intake reduced and tempered the exercise-induced increase in blood pressure in obese participants. Acute and sub-chronic CF intake altered fat and carbohydrate metabolism during exercise. Acute and sub-chronic CF intake did not have ergogenic effects in athletes, while chronic CF intake improved mitochondrial efficiency in untrained participants. While combining sub-chronic CF intake and exercise training improved cardiovascular risk factors and vascular function, evidence on the synergistic effects of CF and exercise training on oxidative stress, inflammation, and fat and glucose metabolism was lacking.

**Conclusion:** CF intake may improve vascular function, reduce exercise-induced oxidative stress, and alter fat and carbohydrate utilization during exercise, but without affecting exercise performance. There is a strong need for future studies examining the synergetic effect of chronic CF intake and exercise training.

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